5

Voice — continued

Sounds — 191

Whispering 192 Speech 195.

Singing — 193

Circulation of the

Blood — 216.

do they produce even the least oscillation.

2 If the lungs of a dead animal be filled with air, and a pressure afterwards made upon the thorax, a sound is emitted from the glottis, not unlike that which was natural to the same animal in its living state. Now no one can suppose the organs of the voice to be in a tense state in a dead animal.

3 If the voice depended upon exciting tremulous motions upon tense cords, then certainly the larynx which is composed of so many cartilages & ligaments, all liable to be drawn into a state of exquisite and acute tension by the action of the numerous muscles which move them, must be essential

to its formation, but Dr Fox in his mang. Dissertation has proved by an actual experi=
=ment upon a pig, that the Larynx may be removed from the throat, and yet a sound nearly natural will be after=
=wards discharged thro' the glottis. —

[4 If a piece of wax be applied to the sides of the glottis, it does not change the voice — but the application of a piece of wax to a violin takes away its power of emitting but sounds & vibrations.]

4 If sound depended upon cords, then the more tense the cord, — the more acute would be the sound, — and the stronger the person who emitted the sound, the more tense of course would

be the cords of his organs of Speech, — at this rate, men who possess more Strength than Women, and who are capable of giving most tone to the organs of Speech, would have more acute voices than Women — but the reverse of this is universally known to be the case. — The Uvula contributes much to the formation of the voice, & yet we know it possesses no tension analogous to a musical Cord. In blowing the Nose, we observe the Sound produced, to be in proportion to the greater or less velocity of the Air thro' the Nostrils, & to their greater or less aperture, now no One can suppose the Nostrils to have the least resemblance in their structure or uses to a corded

instrument. —

Is the resemblance of the organs w.h form the Voice to sundry wind instruments of music, ~~[illegible]~~ afford a strong presumption that Sound in both of them depends upon the same cause?

Is Sound ~~[illegible]~~ encreased in its Strength by the size of the passage thro which air ~~passes~~ passes in a wind instrument? So it is — in the organs which compose the Voice. Is Sound ~~[illegible]~~ encreased by the solidity, ~~[illegible]~~ or tension of bodies thro which it passes —? So it ~~[illegible]~~ is in the organs which compose the Voice? — Is Sound encreased by reverberation as in the Conque Shell? So is the

Voice; — the Larynx — the Pharynx — the mouth and the nose all concur to answer this purpose. — It is found varied by certain uneven surfaces in the instruments thro' which it passes. so is the Voice, — It is found varied by the number and difference of the asperities in the instruments thro' which it passes? so is the Voice. — It is most powerful, when it passes thro' the Glottis, mouth & nose in their greatest State of extension. — — Is the degree of Sound in any case proportioned to the Quantity of Air in a Wind instrument which produces it? So is found. This appears in a more especial

Wonder in Birds who tho' small, ~~[illegible]~~ emit sounds which are far greater than the sounds emitted by many animals of a larger size; now Birds we said formerly contain reservoirs of air not only in their lungs, but in little cells which are connected with them, as also in their very bones and feathers, all of which they employ, not only in Respiration, but in singing. There is another circumstance peculiar to the organs which compose the voice of Birds which deserves to be noticed. Their ~~[illegible]~~ Wind pipe is divided by means of a double glottis - the one which is membranous is placed in the bottom of the trachea - the other which is cartilaginous - in the upper part of the larynx.

a 7th argument in favor of the Voice being formed upon the principles of a wind instrument is that not only the human voice but human speech may be imitated by an echo; now this we know is produced by the reverberation of sound only, & is no ways influenced by anything analagous to a chord.

an 8th argt in favor of this opinion is derived from the influence of certain diseases upon the voice. an abscess in the frontal sinus in particular, Mr Cline tells us has been known to render the voice dull - nor could it be cured till the matter of this abscess was discharged. -

This structure is happily calculated to 189.
~~[illegible]~~ produce ~~[illegible]~~ a reverberation in
Sound, and to supply the Absence of
those sounding bodies which are to be
met with in the heads of men, and
many other Animals.

// Having mentioned the arguments
which render it probable that the Voice
is produced by the discharge of Air thro' the
Glottis, I go on to remark the variety
of tones which are observable in
the Voice depends wholly upon the Variety
of motions in the Glottis. — Mr Dodart
in the memoirs of the Royal Academy of
Sciences computes these motions to a=
=mount to 9632. - This number would be
incredible did we not know that the
ear has in some cases been so far

refined by music as to be capable of Dis=
=tinguishing such an immense variety of sounds
may serve to illustrate
as Mr Dodart's calcula=
=tion. Musicians divide time into
what they call a Batuta quadrata or
the largest touch which is the $\frac{1}{15}$ part
of a minute. This portion of time, they
again divide into four equal parts,
each of which they subdivide into sixteen
parts, so that at last four seconds of
a minute are divided into sixty four
parts, and the whole minute of time
into 960 parts. Now Skilful musicians
know how to run thro the 64 parts of
the $\frac{1}{15}$ portion of a minute so exactly,
that they are able to distinguish each
particle of the time that has been

Sounds are acute & grave according to the greater or less contraction, or expansion, elongation or shortening of the glottis. In uttering of acute and grave sounds, the =

mentioned, every one of which is produced by a different action in the muscles which move the glottis. But the number & celerity of the motions of the glottis in emitting sound go far beyond this instance of acute observation and perception.

Sounds are divided into acute and grave, and into strong and weak.

~~The acute sounds are produced by tension & grave according to the greater or less elongation or the contraction of the glottis. In the altering acute and grave sounds, the or shortening of the glottis.~~

Voice is sometimes lost — this depends in the ~~[illegible]~~ case of acute sounds upon the glottis contracting so closely as to confine the sound altogether — In the case of grave sounds, it depends upon the glottis expanding

so wide, as to leave no rising between the lips of the glottis, and the Larynx — by which means no collision is given to the air in its passage into the mouth.

Sounds are strong and weak according to the strength of the lungs, and the force with which Air is expelled thro' the glottis. — Hence it is weak in children and in old people. Hence probably the reason why it is weaker in women than in men.

~~Tho~~ some Physiologists suppose the glottis to be more contracted in women.

Whispering is produced by so weak an expulsion of the Air from the trachea as to produce no

The trachea is elongated & shortened with the greater or less length of the tones &c. The exercise of the trachea, & glottis in singing are more fatiguing than in speech {In singing base, the peritoneum is very much protruded, & relaxed, & hence the frequency of ruptures and of fat bellies among the members who are great singers in Catholic Countries} —

of those tremors in the Larynx, - Bones of the mouth - nose - and head which produce a distinct Voice. These tremors are perceptable by placing the hand on the head of a person who is speaking with a distinct voice, but they are wholly imperceptable if he speaks only in a whisper. —

Singing is the protraction of the Voice. The tremors produced by singing are so great as to be diffused thro' the whole body, - so much so that persons of nice perceptions have declared that they have felt them in the bones of the extremities. —

The Voice changes in men at

It is likewise varied by the weather. The notes of the nightingale are always sweetest in the month of may. The human voice feels the influence of the vernal sun, tho' in a less degree. It is varied by pain, or different pains produce different cries. — ~~[illegible]~~

2 ~~[illegible]~~ voice is in part imitative, hence we find men of the same country & family have frequently the same ~~[illegible]~~ kind of voices. There is a case upon record by a german author of the name of Shellhamer ~~[illegible]~~ of a boy who by being bro't up among swine contracted their voice so exactly in speaking, that it could with difficulty be distinguished from it. The citizens of the different states of America bray all be distinguished by a sameness & peculiarity of voice.

In order to the voice being clear the passage of the air thro' the nose should be easy & perfect. when ~~[illegible]~~

at puberty from an increase of magnitude & strength in the Larynx at that period of life. — The bones of the forehead & nose which assist in the formation of the Voice likewise suddenly enlarge at the age of puberty. The suddenness, and inequality of the growth of the body at this period, I shall say hereafter is a source of many diseases. —

The Voice is much varied by the Passions. - It is quick and strong in anger - weak and plaintive in distress - soft in love & slow in supplication - all these changes are produced by a difference in the contraction or action of the glottis. *[2] —

* The recurrent nerves is essential to the formation of the Voice. By dividing it, the Voice is destroyed. a weakness

the nose is Obstructed, we are said to speak thro it. The reverse of this is true. we do not speak thro the nose. # see below

~~Bu~~ In explaining the Natural cause of Voice, I must not forget to mention that there is said to be men who speak from their Stomachs instead of their Lungs. They are called Ventriloqui. this is a deception. the Voice

The modifications of the Voice depend on the size of the glottis ~~[illegible]~~, & the length of the Trachea. ~~[illegible]~~

~~[illegible]~~

The Voice is stronger in a standing than in a sitting posture. this is so much the case that it may be perceived in a Congregation when they rise to ~~[illegible]~~ sing the doxology. It is improved by certain diseases, as Delirium - from mob: excitem: It is weakened by eating a full meal, from the Stomach pressing up the ~~[illegible]~~ thorax & lessening their capacity for air out of which the voice is formed. # I cannot conclude this Art.

or paralysis of this nerve is probably the most frequent cause of Paraphonia - & Aphonia as we shall say hereafter. —

Thus far have I endeavoured to account for the Voice. But in considering the functions of the human body our inquiries must not stop here. — A voice alone would give man no pre-eminence above many other animals. It is by the division of this Voice by means of many thousand motions into what is called Speech that man acquires a rank in the Scale of being more singular and unequivocal than that which he derives from his Reason, for in the exercise of this operation of the Mind many Animals have approached very

of the Voice without taking notice of the provision made to prevent its cups injuring the Lungs or Brain, and that is the Thyroid Gland. By opening its arteries it prevents the rupture of the lungs & an excess quantity of blood being sent to y brain when we hollow, or speak very loud or for a great length of time. — That this is the case #

V 1: That there can be no Speech, where there is no Respiration, & when it is not voluntary.

2: by Speech is formed principally as far as the Trachea & Larynx contributes to it, by the Glottis.

If the larynx be cut below the glottis — there will be neither Voice nor Speech — If above, the glottis, there will be voice, but no Speech,

is rendered more certain by those Animals which have no Voice having no Thyroid gland. This Dr Hunter says is the case in the Whale — but Cuvier says — is not so in the Dolphin & Seal.

I forgot Blumenbach comp: Anat: p: 278. trans vers

man him, but in the exercise of Speech he stands alone. — I exclude here the words which certain birds have been taught to utter from my ideas of Speech. — They are wholly unconnected with ideas, and are as truly mechanical as any of the antic motions which have been taught to dumb animals. —

I begin my ~~[illegible]~~ account of Speech by remarking, 3 that it is wholly imitative and that if Children were not taught a language of some kind, they would be forced to convey their ideas like brute animals, entirely by dumb signs or inarticulate sounds. ~~3 4~~

However simple the ~~[illegible]~~ function of Speech may appear, ~~[illegible]~~ it is acquired th:

~~Dr Cu~~ supposed the thyroid gland served the further purpose of arresting the impetus of the blood to the brain, and thereby of lessening the frequency of cephalic diseases, ~~[illegible]~~ This opinion was founded upon an experiment made
see below

V These organs are the larynx - glottis - throat - palate - uvula - mouth - fauces - lips and teeth - ~~[illegible]~~ - nose. Several ~~[illegible]~~ of these parts are prepared for their expectant offices by being supplied by certain previous cavities.

by Mr Cooper who found that dogs became idiotic from the loss of this gland. ~~[illegible]~~ These must have been some mistake in this experiment, for in many persons in whom this gland has been discovered there has ~~[illegible]~~ been no diminution of intellect, nor any other disease of the brain. I believe its use is principally

immense difficulty - seldom in less than 15 or 18 months. I have known three instances in this city of its not having been acquired before the 8th year of life. —

In delivering the process by which children learn to speak, I shall confine myself to facts which have been the result of my own observations, made chiefly in my own family —

I consider the organs of speech sufficiently movable so as to enable them to pronounce the immense number of words which compose a language - it is necessary they should be properly exercised for that purpose. This exercise begins in the larynx & extends to the tongue & ends in the

to prevent the rupture of the larynx in loud singing & speaking. It probably serves, the further use of ~~to arresting~~ ~~[illegible]~~ sensation, in hysterical women and thus to protect the brain. but of this more hereafter.

return to p 194

~~Lips~~ Larynx &
The Glottis are exercised 1 by crying. This
sound so unwelcome to parents because the sight of pain is wisely
sent to set the muscles of the Larynx
& glottis in motion, as well as to procure
relief from distress. — I think I have
observed in one instance the effects of
this motion upon speech, — for the
worst child I ever knew spoke dis=
=tinctly before it was 18 months old.

2 The Larynx & Glottis are exercised by
Laughing — this begins early in life,
and is attended according to its degree,
with very different dilatations, and
contractions of the Glottis. Perhaps the another
~~principal~~ reason why Crying & Laughing are peculiar
to the human species is to form the rudiments of speech.

3 Crowing — this exercise generally
begins about the 5th month. It is

See here again - the further uses of crying - laughing &c - Besides promoting Respir^n & by its means Animal life, they are necessary to the production of Speech!

a slow ~~expulsion~~ inspiration expulsion of the air thro the lungs attended with the sound of ou-ou-ou-. It is to parents generally a very pleasing sound.

The tongue are exercised about the 7th or 8th month. Its first sounds are generally dad, - dad, - dad; - hence the origin of the epithet Daddy - It is assumed ~~by the child~~ as the first salutation of a child to its father. Take notice here the lips are not exercised in pronouncing this word.

The muscles of the lips begin to be exercised about the 9th or 10th month by uttering the sounds of pap - pap - pap - mam - mam - mam - mam, - hence the origin of the epithets - Papa - & mama. - It is remarkable that in most of the languages we are acquainted with, parents are called by

✓ Sometimes children exercise their lips by playing ~~them~~ on them, or blowing wind thro' them [in the following manner. Here shew both]

+ This very name is derived from the latin word Vox, ~~[illegible]~~ voice – to denote this preeminence in language to be such as that they are a part of the voice, preparatory to Speech. Consonants are the flesh & muscles of languages. They are all # ~~Further~~ The preparation of children to acquire Speech is further assisted by the growth of the foreteeth, which are generally formed before they are 18 months old, & which in every period of life are useful in the formation of Speech.

soft & agreeable in proportion as they abound in vowels. ~~[illegible]~~ The Greek & Italian are the most agreeable languages in the world to the ear upon this account. The German, Swedish, Danish & English are the last so, from their abounding with consonants. ~~[illegible]~~

of Lingual - or
Names which have some labial letters
in English. Dadda - Papa - mama - in French -
in them - as ~~Pater~~ - father - mother Père - Mere -
Pater in latin - Fader & moder in german
Madre - Padre in Spanish ~~&c~~ and chinese
Foochin - father - & moochin mother in the
language! By the constant exercise of the
muscles ~~&c~~ which move ye glottis -
Larynx - tongue & lips - in this way,
for 18 months or two ~~&c~~ years, Child-
-ren are prepared to acquire the know-
-ledge of a language ~~&c~~ or of articulate
Sounds. — It is remarkable that in
all the inarticulate Sounds which I have mentioned,
we find some of the Vowels - for these
are the Skeleton of all languages ~~&c~~

Language or words like Speech are acquired by
Children likewise only by imitation. The ear
and the eye are the avenues thro'
which the Use of Speech is conveyed

There is one of the consonants which has been distinguished above all others by its ungraceful effects not only upon the ear, but upon the whole body & that is the letter R. — Salzman relates a story of a German of the name of Kersting who was taught the letters of the alphabet by placing his hand upon his wife's mouth & discovering the exact motions of which accompanied her pronouncing every letter. upon her pronouncing the letter R – a sense of horror attended with shuddering, pervaded his whole frame. It would seem as if there existed a natural antipathy to this letter in the human ear – hence it seldom occurs in the languages of the Indians nor of the Africans. From the latter, the white inhabitants of countries in which negro slavery exists have learned to leave out the letter R

to them. —

After children have brought forward as it were their little organs of speech completely supplied by the exercises to their parents' I have mentioned, ~~to their parents~~, they endeavour to imitate them in the pronunciation of single words. These words are always at first substantive nouns. — In their first attempts they make many mistakes — the sounds or words they utter are often as widely different as they can be from the words they are desired to utter. But their little ears inform them of their mistakes and they attempt to correct them. — This sweet affords them exquisite delight, and if they repeat the word

in most of the English words in which it occurs. ~~[illegible]~~ hence we hear the words summer = ~~[illegible]~~ winter - papes - Dinner - Supper - fear & fire ~~[illegible]~~ pronounced ~~[illegible]~~ summa - winta - papa - Dinna - Suppa - fea and fia - by persons of the first rank in these countries. ~~[illegible]~~ A kind of Rphobia seems to have crept into their language. ~~=~~

go back to Op 200 opposite side.

they hit upon, half a dozen times, they seldom forget it - but if they do not, they often lose it - and sometimes do not recover it for two or three months. - If children can make you understand what they mean, when they call any thing by a false name, they will seldom take much pains to correct it. - I have known a child call a Chariot a tarr - & Sugar, - Billy - long after he could pronounce half the words in our language merely because his parents consented to know what he meant by them.

In acquiring a language, Children are much assisted by looking the persons in the face who speak to them. - They acquire in this way ~~a~~ much ~~[illegible]~~ the pronunciation

They likewise acquire words much sooner, when they are sung to them than when they are only spoken, and for this reason, expressed, words thus, dwell longer upon the ear, and being accompanied with pleasure, more pains are taken to retain them. It has been said that ideas were conveyed originally in musical tones, and that language has lost its tones by the habits & pleasures of civilized life. It is certain all Savages are fond of music, that they express their passions in musical tones, & that even their voices are tinged with them. Their tones moreover are not only simple, but extremely plaintive, & melancholy - a proof among an hundred others that might be mentioned, that they are every where & uniformly miserable. To return —

of all those words which are spoken by the motion of the lips. * [of this more presently]

The pronunciation of a child is seldom correct at first, — even where the utmost pains have been taken by parents to prevent their being spoken to in a childish manner. — Those words in our language which have ~~th~~ the letters th — connected in them as <u>this</u> - <u>that</u> <u>the</u> &c are always learned with a great deal of difficulty. Foreigners seldom pronounce them perfectly.

Speech ~~[illegible]~~ is not only acquired by imitation, but many of its peculiarities are influenced by it - hence whole countries - towns - families - & Schools have been remarked to speak a like. These peculiarities are acquired chiefly under 12 years of

I will illustrate what I mean by each of those distinctions of sounds in different languages. G. and O. produce guttural letters. B and P produce labial letters. C and S: dental letters. L and R lingual letters and M & N nasal sounds.

age. After that period the muscles
more the organs of Speech are less easily
affected by imitation. I exclude here
those peculiarities of Speech which are
acquired by affectation. These are
picked up at every period of life.

Languages differ from each other in
the different proportions of words which
are uttered by the throat - tongue teeth lips - those
exclusive
of each other. Hence languages
are called guttural - lingual -
Dental labial and nasal according as the throat
tongue or lips predominate in each of
them. The following letters of the alphabet

Indolence has a great influence
upon Speech. Hence we find the fewest
muscles employed in the languages of
Savages who are all indolent. The

* In the pronunciation of Consonants the Uvula - the palate - cavity of the nose - tongue - teeth - lips - are all employed. - The Hebrews early observed this, and have divided their consonants according as they employed these different parts into guttural - palatine - Dental - labial & nasal.

Indians in this country use their tongues and lips as little as possible in conversation. Even at public treaties, they grant their assent to what is proposed to them thro' their throats. All their languages partake largely of guttural sounds.

Indolence has the same effect upon the languages of civilized nations. The plethora of Vowels (If I may be allowed the expression) which composes the Italian language seems to have arisen from that cause - for fewer muscles are employed in pronouncing words that abound with Vowels than Consonants.

The Arabians who are indolent from climate & government, use their tongues only,

+ The same as in exposing the emotion of pity.

Rapidity of Speech is much influenced by facility in hearing, & quickness of perception. — Old men speak slow — because they hear imperfectly. — It is likewise influenced by the greater or less velocity of the circulation of the blood. It is rapid in a fever of great morbid action, also in anger, and it is slow in a fever in which the circulation is feeble as in the typhus, & also in a depressed state of the mind. By attending to this remark we may know the state of a patient's circulation only by hearing him speak, before we feel his pulse.

in an affirmative } in a peculiar species of intonation† — [describe it.] ‡

Some of our fellow citizens Gent: (but I shall not ~~say where~~ mention the states to which they belong) use an affirmative that is uttered with nearly as little trouble — by throwing the Voice against the roof of the mouth, and thro' the nose. — [describe it] ‡

Thus — have I described the origin — formation — & variety of Speech among men. That the Acc.t I have given you is a just one, I infer from the success which attended the attempts that have been made to teach the dumb to speak. It was first discovered by ~~[illegible]~~ a Spanish monk of the name of Portiers and after ~~[illegible]~~ being improved by

persons dumb, but Mr Sicard remarks it would be more proper to call them silent.

teach them to understand what is said to them. This has been done, by teaching ~~persons who are~~ the dumb or silent, ~~to~~ to observe the exact motions of the ~~to~~ tongue and lips in the persons who speak to them, each of which have precise motions for every word they ~~of~~ utter. In this way com=

several other persons (Vol 207) perfected by Amman a Dutchman - a contemporary of Dr. Boerhaave's - and has since been adopted, ~~but I do not [illegible]~~ by a Mr Braidwood of Edinr. an acct of which you will find in the Encyclopedia. ~~[illegible]~~ It has likewise been adopted ~~[illegible]~~ by Mr Sicard - of France.

To understand the nature of this ~~[illegible]~~ useful art, it will be necessary to remark that in most of dumb persons who are likewise deaf, there is no defect in the organs of Speech. They do not speak only because they cannot hear, - and hearing is the sense thro' which Speech is chiefly acquired. — It is common to call such

The first thing done is teaching the dumb to speak, ~~[illegible]~~

of which

V After they have been taught to under=
=stand what is said to them by signs is to supple

The Scholars is then
" directed to place his
hands upon the larynx of his mas=
=ter, and to observe the exact tremors
or motions which accompany every letter &
word the letters, which letters and words are written
down, in order to be committed to memory by him. The master
then directs him to take the same notice of the
motions of his lips in speaking ... After
having previously discovered the exact

13. - he would direct him to shut
his lips, and at the same time expel
the air forcibly from the lungs - or suppose
he should direct him to pronounce the word
paper "

the Larynx, & to teach them to expel air thro' it so as to excite an inarticulate sound. The Larynx is supplied by frequent=
=ly prefixing it. motions w: ch it is necessary to give the tongue & lips in every word in a language, the master now directs his Scholar to make those motions in the instant of their expulsion of the air from the lungs. — E.g: Suppose he wished him to pronounce the letter t he would order him to expel the air from his lungs two different times in a quick succession. During the first time - he would tell him to thrust his tongue against the lath of his lower law, & to

In this way Dr Waller tells us
Amman taught a boy to speak
read - and write in one month, and a
girl in two months, but in general,
it required a whole year to complete
the education of a Deaf or silent
person in the manner I have mentioned.

But Amman not only taught the
Deaf to speak, but from his accurate knowledge
of all the motions in the organs of
speech which take place in the pronun-
-ciation of letters & words, he corrected false
or bad pronunciation. For example he
directed a boy who used the letters (t) and (d)
instead of (k) to depress the
tongue with his fingers in order
to prevent its striking the
upper teeth. — After a while he was able
to depress his tongue the power
his will acquired over it.

close his lips together at the same instant - this would produce the syllable pa - During the 2nd time he expelled the air from his lungs, suppose the master should tell him to raise the tip of his tongue towards the roof of his mouth and at the same instant to close his lips - the syllable uttered would be - pes - which connected the 2d: pa - would be paper. V

By attending to this process I cured a little boy of using W for V in the word ~~[illegible]~~ of ~~[illegible]~~ ~~[illegible]~~ lin=
=gers and veal ~~[illegible]~~ -

agreeably to the ~~[illegible]~~ unique mode of speaking ~~which is permitted in~~ ~~[illegible]~~ is ~~[illegible]~~ practised by some of the citizens ~~of the United States~~ ~~[illegible]~~

I directed him to press the tip of his upper jaw upon his teeth

V Some words are imperfectly pronounced from the ligament of the tongue not being cut in early life. I have in several instances cured these imperfections of Speech by cutting this ligament where it has been of a preternatural length.

Speech is impaired not only by the loss of the foreteeth, but by their preternatural size, and projecting in clusters instead of growing in rows from the the upper & lower jaws. This defect in Speech has been corrected by removing some of the teeth, or opening moderate apertures between them, or reducing their length by means of a file.

his lower lip every ~~th~~ time he attempted to pronounce those words. — They came forth as soon as he did this, with the proper sound, to his great astonishment & delight.

V Dumb or silent persons who have been taught to speak in the manner I have desci=bed, are frequently able to hold a conversation only by observing the motions of the lips of the persons with whom they conversed. — Amman taught a man to repeat what he said, only by directing him to move his lips as he moved his, and at the same time to expel air from his lungs. He taught a boy so perfectly to hear with his eyes, in this way, that he could (if I may be allowed the expression) take down

It is recorded
~~[illegible]~~ of
Sam Boerhaave, the nephew of the
celebrated Dr Boerhaave that he received
~~[illegible]~~ impressions upon his ears thro'
the medium of his hands & feet.
This was a translation of a sense,
of which I shall speak more
fully hereafter. —

in writing a sermon, and afterwards read it word for word to his friends when he went home. The Acuteness of perception in the eyes in these cases goes almost beyond conception. It is possible they may perceive & distinguish some of those tremors I before spoke of which are communicated to the head in speaking, for each word I have no doubt has its peculiar and specific tremor or vibration. Should this be the case, it would not ar=
=gue more acute Light, - that was dis=
=covered in the sense of hearing in the two Dutton whose history you will find in the Lectures upon Animal life. V

I shall have occasion to

In explaining the nature of Speech, I must not omit to mention that are men called Ventriloqui who are said to speak from their Stomachs. This is altogether a deception. The Speech is formed by the inspiration instead of the expiration of Air, and the Voice & Speech are in the lungs & not in the Stomach. I shall resume this Subject when I come to treat of Sound.

In reviewing the wonderful gift & exercise of Speech, it is impossible not to be struck with the number & exility of those motions in the Larynx Glottis - tongue - & lips by which it is performed. The English language consists of more than 40,000 words, nearly every One of which is uttered by motions in the Above Organs different

resume this subject when we come to ~~[illegible]~~ mention the ~~[illegible]~~ cases of morbid voice and Speech in our pathology - When I shall explain some matters which ~~[illegible]~~ would be foreign to a lecture on Physiology.

~~It remains only that I mention the use of Speech. But here Gent. I am less at a loss what to say than what to leave unsaid. I shall ~~[illegible]~~ only observe that by Speech man is ennobled above all the creatures in the world. - It was by means of Speech that the venerable Sage instructed ~~[illegible]~~ his Children before the invention of writing & printing - By the use of this function we carry on ~~the~~ business of the world - ~~[illegible]~~ It is the instrument ~~of~~ by which knowledge is~~

Brutes are stationary in their knowledge in part, because they have no Speech.

from each other. This will not be incredible to you when you recollect the number & variety of sounds which I mentioned at our last lecture, and which are distinctly perceived by a good musical ear. — But our wonder should not cease here. We meet with persons who speak, with the Latin & Greek most of the modern languages of Europe. The distinct motions in the organs of Speech of these persons probably amount to many hundred thousand, & are all at the same time so perfectly correct as to convey in an instant precise ideas to the persons who understand them. I beg you would remember these facts. I shall have occasion to apply them, when I come to treat of the nature & operations of the human mind.

chiefly conveyed from man to man — It is the ~~vehicle~~ vehicle of eloquence — of friendship — and love. — ~~as~~ But above all — it is one of the means by which we are permitted may more commanded to address the great father of the Universe, and to celebrate his works among the children of men.

Mr Boyle ~~and~~ we are told made it a practice always to ~~make a short~~ pause in conversation when he mentioned the name of the Supreme Being — Did we contemplate fully all that is known of the wonderful manner in which the voice and speech are formed, we should go beyond Mr Boyle in our homage to the Deity. — ~~we~~ Every time we utter a word, that conveyed an idea to a friend, or to the public, we should

remains now ~~that~~ I mention the uses of Speech. By it, man is ennobled above all the creatures in the world. Brutes are stationary in their knowledge chiefly because they are ~~[illegible]~~ destitute of this precious gift of heaven. Hence there is no Speech ~~no words~~, ~~[illegible]~~ there can be but few ideas, ~~for~~ words are ~~[illegible]~~ said to be the signs of ideas. ~~[illegible]~~ They are the cloaths of ideas, and without them, ideas soon perish in the mind. ~~[illegible]~~

~~[illegible]~~ I shall only add that this precious ~~& characteristic~~ discriminating of man, has been supposed to be the result of the gradual & successive operations of human reason. I cannot assent to this opinion. Had Speech depended upon this cause, I believe at this day we

pause to admire the infinite wisdom which is displayed by the divine architect in the structure of these organs by which that word was pronounced.

Lect: 9th go on to p 216

[I have not yet lost sight of the human figure whom I fancied I first met with on a visit to our globe. After surveying the manner in which the motions of his breast were performed in Respir.n I was led into a short digression by enquiring more particularly into the nature of those motions which he uttered Voice & Speech. He spoke - Having satisfied myself of the cause & manner of each of them, I was next led to inquire into the nature of those involuntary motions which

should have been but little above our
Domestic animals in our attainment &
knowledge of it. There can be no doubt but
speech was originally given by the same
~~[illegible]~~ divine power which multiplied languages
at Babel, and which ~~[illegible]~~ in after ages im=
=parted to the twelve apostles the gift of
languages, and that our great progenitor
spoke one of them as certainly as that he
breathed or walked, for the historian that
relates the one, relates the other. The posterity
of Adam acquired speech and language only
by instruction & imitation, as they have
done the knowledge of a thousand other things.
Our fathers have been to us what the Creator
was to Adam. The only difference in the
manner of our learning to speak is, we
require 18 months, or two years to learn

lay beyond the reach of the eye sight, particularly ~~into~~ the motion of the heart ~~— Feel here — I fancied they~~ of which he spoke frequently in describing Respiration. — Feel here said he —— upon this, I imagined he placed my hand on his breast. — Beneath it, I felt a strong pulsation. — This said he is the heart. ~~It has~~ ~~beat in this~~ ~~stand~~ It has beaten in this manner for near 5000 times in an hour 30 years without one moments repose, — It is in one respect the fountain of life — ~~a source~~ ~~Lifeu of mysteries~~ — all the functions of the body depend more or less upon it. — It moves the brain, and is again moved by it — It furnishes the fluid from which all the secretions

to speak perfectly, Whereas Adam was
divinely ~~taught~~ taught to speak perfectly in a few hours,
or perhaps in an instant. ~~[illegible]~~

Having ~~[illegible]~~ described the function
& uses of Respiration, more especially
its application to ~~[illegible]~~ Voice
& Speech, we proceed next to treat of
the next effect of ~~the~~ inflation of the lungs, that
is the circulation of the blood. and
here I shall first inquire into = p:216

of the body are obtained, — in short its presence, and action are essential to ~~animal~~ ~~life~~ life, ~~in the~~ not only in the human but in most of the animals in the world. The prickly Hydra & one or two animals are the only exceptions to this Observation. — ~~But what is the Structure of their hearts~~ In delivering the rest of the information derived in ~~inquiry~~ ~~in this~~ way I shall, ~~first in consider the~~ ~~the~~ ~~action of the heart inquire into~~ the course of the blood after it passes thro' the lungs where we left it in treating upon Respiration. 2dly I shall ~~inquire into~~ describe some peculiarities in the Structure of the heart & blood vessels. 3dly I shall inquire into

the powers which move the blood, and
4ly mention the advantages which are
derived to the system from this impor-
-tant function in the Animal Oeconomy.

1st The blood after passing thro' the
pulmonary arteries is received by the
pulmonary veins, by which it is
conveyed into the left auricle of the
heart — from whence it passes into the
left ventricle thro' which it passes
into the Aorta, which conveys it by
numerous branches into every part
of the body. The blood thus distributed
thro' the body, ~~consumption into~~ whether
discharged ~~into~~ immediately into con-
-tiguous & connected veins — or into

glands for the purpose of secretion - or into cavernous substances, as the corpora cavernosa penis - or into serous vessels, is all conveyed into the veins which meet in the Vena Cava this which it is poured into the right auricle of the heart, - from whence it is emptied into the right ventricle of the heart from which I said formerly it was thrown into the lungs in Respiration.

It is remarkable that the auricles & ventricles of the heart are perfectly synchronous - that is, both auricles contract, and both ventricles expand at the same time. The expansion of the heart is called its Diastole - its

contraction is Systole. It is computed ℥ ℥ij of blood are discharged from the heart in every contraction. The valves - which prevent the reflux of the blood into the Auricles & Ventricles of the heart will be accurately demonstr: & explained by the Professor of Anatomy.

- That part of the blood which is exha=
=led in a contorted form into ur=
=tain cavities and upon most of the External Surfaces of the body, and which is not taken up by the Veins, is absorbed by a second Sys=
=tem of vessels called Lymphatics. These serve a variety of useful purposes to be explained hereafter, but one of them is evidently to act as

it were, the part of an hand maid to the veins, - to pick up the fluids which were too numerous - too weighty - or too much diffused, to be absorbed or carried by them to the heart. After collecting this fluid from every part of the body, the Lymphatics pour it with the Chyle into the left subclavian Vein from where

~~[illegible]~~

~~[illegible]~~ (After having performed its journey home by a different route) it enters with its hindred blood into the heart. —

~~2 I come now now to mention some peculiarities in the structure of the heart & blood vessels which favour the circulation of the blood in the manner~~

ب

~~that has been described.~~

That the course of the blood I have described in the ~~true~~ one, I infer from the following facts & experiments.

1 From the effects of haemorrhages which discharge blood alike from every part of the body.

2 From the situation, structure, and functions of the Valves of the heart, which admit of the blood's passage only in one direction.

4 From the effects of Ligatures which cause the veins to swell below, ~~than~~, & the arteries above the place, where they are applied.

3 From the structure of the Valves of the veins which likewise admit of the blood's passage only in one direction.

5 From the Connexion & Continuation of Arteries and Veins being demonstrated by injections and microscopical Observations.

6 From the effects of tying a vein in a living Animal near the Cava, or from tying one of the pulmonary Veins. The part which is most remote from the heart in either of these exp. always swells, while that part which is nearest the heart becomes flaccid. If a corresponding artery be tied at the same time with the Veins, the Veins become empty, nor do they fill again Untill the ligature is removed from the Artery.

7 & lastly from the effects of transfusions

in which ~~the~~ blood ~~[illegible]~~ is conveyed from the arteries of one animal into the veins of another animal previously exhausted of its blood, by which means the blood vessels of the exhausted animal are completely filled, and the circulation carried on thro' them with vigor & regularity.

II I come now to mention some peculiarities in the structure of the heart, & in the structure & course of the ~~[illegible]~~ blood vessels which favour the circulation of the blood in the manner that has been described.

1 The position of the heart in the Thorax where it is fenced by a bony case on every side greatly favours its free & constant ~~action~~.

V 5 It is the reddist muscle in the body in man & all animals that have red blood. ~~the~~

~~V~~ 6th It beats near 5,000 strokes in an hour, and during the longest life, knows no intervals of rest. It moves the brain, & is again moved by it. It ~~[illegible]~~ is chiefly instrumental in conveying ~~the~~ that fluid to every part of the body from which all the Secretions are obtained. Its presence & its action are necessary to life, not only in man, but in most other Animals. The prickly Hydra, and one or two more Animals are the only exceptions to this observation. ~~the~~

~~the animal~~ The size of the heart is generally in pro=portion to

2 Its internal covering called Pericardium, while its favours (from the vapor or water which it constantly contains) the more easy action of the heart, serves to defend it from the compression of effused fluids in the thorax. —

3 The Cardiac nerves are accompanied by the a coronary Artery which supplies the heart with blood. Now this Artery serves to give a more exquisite degree of sensibility to the nerves of the heart by keeping up their tension.

4 The heart is evidently a hollow muscle, with some ligamentous parts, but possessed of all the properties of muscular fibres in every other part of the body. —

~~5 From this pericardium of the heart, it~~

the Strength of an Animal.

8 It possesses two Auricles and two Ventricles in the human Species and in all Animals that breath like him. In the whale, and in amphibious Animals it has two Auricles & one Ventricle. It has one Ventricle and Auricle in fish. It has but ~~one~~ a single Cavity in the testacea & some Insects. ~~and~~ It identifies itself ~~with~~ with a kind of Arterial Canal in worms & some insects & it disappears in the polypus & certain Zoophytes.

✓ It is remarkable that the right Ventricle continues to beat longer by several strokes in a dying Animal than the left.

10 ~~#~~ Its cavity is more irritable than its external Surface. In frogs ~~turtles~~ & several other Animals it retains its powers of being acted upon a day or two after death. Its sensibility is by no means equal to its irritability. Even when diseased or inflamed, the pain that is felt is Anxiety, the pain is dull. It is rather

See Harvey p 285. ✓

It has been found that the

~~It would follow from this reasoning, & principle,~~

9 Many experiments prove that it possesses ~~[illegible]~~ possess an exquisite degree of ~~[illegible]~~ stimulability; ~~[illegible]~~

~~[illegible]~~

~~[illegible]~~ In a dying person, or even in a person lately dead, the heart may be excited into action by the ~~[illegible]~~ stimulus of water or air injected or inflated into it ~~[illegible]~~ or by heat, by certain Vapors, or a Spark of Electricity. It is certainly the most irritable muscle in the body: ~~[illegible]~~

Of the Arteries

~~[illegible]~~

~~[illegible]~~ The following peculiarities with respect to the Arteries deserve our notice, ~~and~~

~~[illegible]~~

1 Their coats - The external is cellular - ~~[illegible]~~ the internal is a fine polished substance intended probably ~~[illegible]~~ as a covering

~~[illegible]~~ Its want of sensibility in a healthy state ~~[illegible]~~ has been proved by Dr Harvey by many facts par-
-ticularly by the history of a young nobleman who when a boy fractured his ribs on his left side. A tissue ensued which produced an opening in the membrane that exposed the motion of the heart. Dr Harvey pressed this

membrane of the heart with it, but without giving the least pain. ~~The~~ He conducted his patient to King Charles who ~~[illegible]~~ ~~[illegible]~~ did the same thing, and with a similar issue to the exp^{t}.

heart is more irritable in young Animals than in such as are full grown; hence it does not beat from the influence of the will & afterwards from habit, as was supposed by Dr Berkley.

[11 To all these facts I shall add one more communicated to me by Dr Alex^r Ramsay an eminent Anatomist from Edinburgh in the District of Maine. He says he has uniformly found the left Ventricle of the heart larger in all the Americans he had dissected than in Europeans.]

to the Middle which is more obviously a muscular coat of the Artery. This coat is of so compact a nature, and so much more like a membrane or an ex-pansion of tendon, that Dr Haller & Dr Wm Hunter have both denied that it possess that stimulability which belongs to muscular fibre in other parts of the body. This Question shall be controverted in its proper place. In the mean while I shall only add y.

I shall maintain an opinion contrary to both those Physiologists, & perhaps I may prove that Dr Haller in spite of his objections to it, has in-directly assented to it. —

✓ This simple Elasticity is greater near the heart, where it is most necessary than in their extremities. ~~[illegible]~~

~~[illegible]~~ Dr. Hunter supposes the seat of Elastic power is in the external, & of the muscular power in the internal ~~[illegible]~~ coat of the Artery.

The heart and the Arteries are synchronous in their pulsations - that is they are felt at the same instant. ~~[illegible]~~ - ~~[illegible]~~ contraction ~~of the heart~~ forms the pulse of the heart - dilatation forms the pulse of the Artery.

2 All the Arteries have nerves and blood vessels – their blood vessels are called Vasa Vasorum. They come from neighbouring Arteries & not from themselves. They are likewise supplied with lymphatics.

3 The Arteries possess great mechanical elasticity. This is evident from the pressure which ~~the~~ a small piece of the artery of a dead Animal makes upon the finger. This simple elasticity is greater in a dead Animal than in a living one – owing to the diastole of the heart acting upon it in the living state. It is this distention of the arteries by means of each diastole of the heart that constitutes the Pulse. – It is common to all the Arteries, but imperceptible in the smaller ones, except in cases of inflammation.